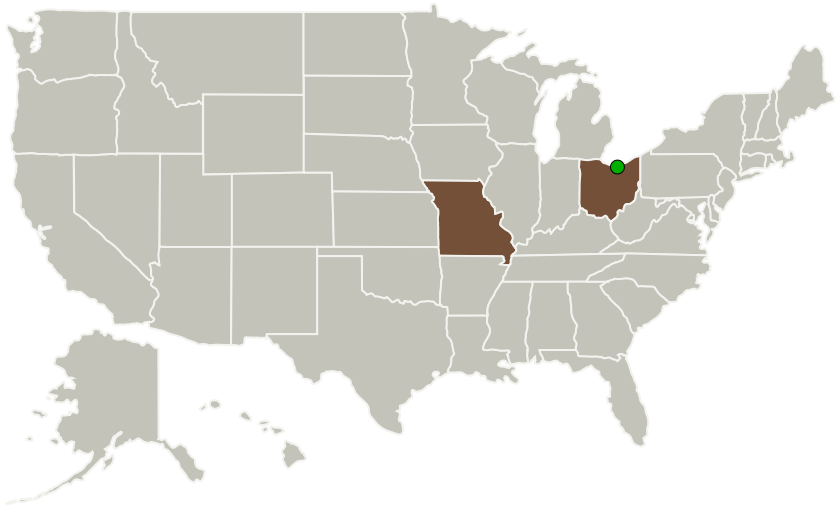
Extension of the Eddy Dissipation Concept for Improved Low-Cost Turbulence-Chemistry Interaction Modeling, Phase I

Completed Technology Project (2012 - 2012)

Project Introduction

The one CFD modeling area that has remained the most challenging, yet most critical to the success of integrated propulsion system simulations, is turbulence modeling. There is a need to develop mid-level CFD models for the interaction of turbulence and chemical reactions that give superior results to the simple models (e.g., Magnussen's Eddy Dissipation Concept), but which do not require the large computational expense of the very complex models (e.g., PDF evolution methods or the Linear Eddy Method). This SBIR program proposes to develop this capability by extending the Eddy Dissipation Concept of Magnussen (EDC) to allow for improved modeling of reacting flows—especially diffusion flames where the flow contains significant regions of mixing prior to combustion. In Phase I, the proposed approach will be demonstrated using a Magnussen model with a global one-step reaction mechanism. The effect of the modified model on the predicted combustion relative to the original Magnussen EDC will be demonstrated on a test case.

Primary U.S. Work Locations and Key Partners



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Organizations Performing Work	Role	Type	Location
Innovative Technology Applications Co.	Lead Organization	Industry	Chesterfield, Missouri
Glenn Research Center(GRC)	Supporting Organization	NASA Center	Cleveland, Ohio

Primary U.S. Work Locations	
Missouri	Ohio

Project Transitions

February 2012: Project Start

August 2012: Closed out

Closeout Documentation:

- Final Summary Chart*(https://techport.nasa.gov/file/138146)*

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Innovative Technology Applications Co.

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

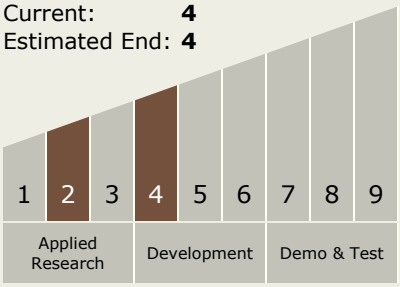
Carlos Torrez

Principal Investigator:

Christopher C Nelson

Technology Maturity (TRL)

Start: **2**
Current: **4**
Estimated End: **4**



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Completed Technology Project (2012 - 2012)

Technology Areas

Primary:

- TX15 Flight Vehicle Systems
  - TX15.1 Aerosciences
    - TX15.1.7 Computational Fluid Dynamics (CFD) Technologies

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System